



Water quality in an experimental Recirculating Aquaculture System as affected by biofilter mode of operation

Fernandes, Paulo; Pedersen, Lars-Flemming; Pedersen, Per Bovbjerg

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Fernandes, P., Pedersen, L-F., & Pedersen, P. B. (2014). *Water quality in an experimental Recirculating Aquaculture System as affected by biofilter mode of operation*. Abstract from 10th International Conference on Recirculating Aquaculture, Roanoke, Virginia, United States.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Water Quality in an Experimental Recirculating Aquaculture System, as Affected by Biofilter Mode of Operation

Authors & affiliation

Paulo Fernandes[‡]
Lars-Flemming Pedersen
Per Bovbjerg Pedersen

Technical University of Denmark
DTU Aqua – National Institute of Aquatic
Resources
Section for Aquaculture
Niels Juelsvej 30
9850 Hirtshals

[‡] Corresponding author:
Tel.: +45 35 88 32 65
Fax.: +45 35 88 32 60
pafe@aqua.dtu.dk

Abstract

Biofilter performance and capacity in Recirculating Aquaculture Systems (RAS) is affected by several factors, such as inlet concentrations of specific compounds, but the significance of some of these products to biofilter performance is not well understood. Several studies have demonstrated the differences between biofilter type and mode of operation in terms of nitrogenous substances removal. Yet, few published studies have focused on filter type effects on organic matter balances and particle size distribution, under controlled conditions.

In this study we compared biofilter performance of two types of biofilter: fixed bed (FB) and moving bed (MB) reactors ($N=4$). The media elements chosen were uniform carrier media (RK Bioelements, $750 \text{ m}^2 \cdot \text{m}^{-3}$, RK Plast, DK) with two different densities: $1.2 \text{ kg} \cdot \text{m}^{-3}$ for FB and $1.0 \text{ kg} \cdot \text{m}^{-3}$ for MB. All filters were connected to the same system, comprising 5.5 m^3 fish tank stocked with rainbow trout (30 kg), a $40 \mu\text{m}$ -drum filter, four trickling filters and four similar biofilters (equal in size, filling rate, specific surface area of media and hydraulic load), was operated under constant conditions (2 kg feed/day and 2 m^3 make-up water/day) for more than three months. The cumulative feed burden (CFB) was maintained constant during the whole experimental period, and nitrification rates, organic matter removal and resulting water quality were evaluated at the system and at the individual biofilter levels.

Sequential bypassing of one or the other type of biofilters was conducted under controlled steady-state conditions during a 3 months period. Nitrification performance and capacity of the bypassed biofilters was assessed by Total Ammonia Nitrogen (TAN) and $\text{NO}_2\text{-N}$ spikes, and effects of biofilter type on resulting water quality parameters (organic matter, particle size distribution, nitrogenous compounds and bacterial abundance) was assessed.

The biofilter type (FB or MB) effect on RAS water quality and performance was studied by sampling pooled 24-hour samples collected at the inlet and outlet of each biofilter. Water samples were analyzed for COD, BOD_5 , PSD, dissolved-N ($\text{NH}_4\text{-N}$, $\text{NO}_2\text{-N}$, $\text{NO}_3\text{-N}$).

N, Urea-N, Total-N) and microbial abundance. Individual grab samples were collected during spiking every 15 minutes, and analyzed for TAN, Urea-N, $\text{NO}_2\text{-N}$ and $\text{NO}_3\text{-N}$ in the TAN spiking events and for $\text{NO}_2\text{-N}$ and $\text{NO}_3\text{-N}$ in the $\text{NO}_2\text{-N}$ spiking events.

Data obtained through the execution of the described protocol, reporting nutrient balances in RAS as affected by biofilter mode of operation, will be presented and discussed.